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Distribution in Idaho of the Disease on Peach and Cherry Caused by the Western X Virus

Results of Surveys Conducted in 1948, 1949, 1950, and 1951

by

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DISTRIBUTION IN IDAHO OF THE DISEASE ON PEACH AND CHERRY CAUSED BY THE WESTERN X VIRUS

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By C. W. Hungerford* and C. W. Nichols†

INTRODUCTION

The disease of cherries and peaches caused by the western X virus has become widespread and destructive in the Pacific Northwest on peaches and cherries. In an attempt to learn more about the disease and its distribution in Idaho, the University of Idaho Agricultural Experiment Station and the Idaho State Department of Agriculture conducted surveys of commercial cherry and peach orchards in 1948, 1949, 1950, and 1951. This publication is intended to summarize the results of these surveys.

Several investigators have established the fact (23, 14, 16) that the little cherry disease on cherries, western X disease on peaches, and the "red leaf" disease of chokecherries are caused by the same virus. A comprehensive summary of information on virus diseases of stone fruits and an excellent list of literature on the subject is given in the Agriculture Handbook No. 10 published by the U. S. Department of Agriculture (3). In the Handbook the little cherry disease considered in this publication has been given the name western X little cherry and the virus is referred to as Western X disease virus. These names are used in the following discussion.

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History and Nature of the Disease

A virus disease called "buckskin" was first described on sweet cherries in California (21) in 1929. Since that time there has been a number of other virus diseases, including little cherry, reported on cherry and other stone fruits as being similar to or related to the buckskin disease. The name little cherry was first given to a virus disease of cherries in British Columbia in 1933 (11-12). In 1942 a disease that has been called both little cherry and buckskin was reported in Oregon (25). Little cherry was reported in Washington in 1946 (9) and in Utah in 1948 (23). Conditions which may have been little cherry or possibly pink fruit were observed by Blodgett (4-7) but it was not until 1947 (13) that the disease was positively identified in Idaho.

Other virus or virus-like diseases of cherries reported as being related to or similar to the little cherry disease are pink fruit on sour cherries in Washington (22), small bitter cherry of sweet cherry in British Columbia (15), reversion on sour cherries in British Columbia (17) and albino cherry on sweet cherry trees in Oregon (10).

The western X disease virus, when it infects sweet and sour cherries, causes definite symptoms only on the fruits. Large numbers of fruits are set and retained on diseased trees. Fruits are more pointed than normal and will hang on the diseased trees for the entire season retaining the light red color of immature cherries. Although slight symptoms on the foliage have been reported, they are not dependable for diagnosis. In Utah, on mahaleb root stock a wilt of sweet and sour cherry trees and death of individual branches called "decline" results from infection by the virus. The typical western X little cherry symptoms described above occur only in mazzard root stock. There are exceptions to this in some other areas.

Blodgett (7,8,5,6) reported western X disease on peaches in Idaho. Symptoms on peach leaves do not become readily apparent before July 1. Leaves on infected portions of the trees are first light green, then develop red and yellow colors and a shot-hole or tattered condition with reddish spots and water-soaked areas scattered over the entire surface of the leaf. Severe premature leaf fall is characteristic. Most of the fruits on affected branches drop early. The few which are retained are small, pointed, withered, and insipid to the taste.

On chokecherries the virus causes stunting of growth, and the development of bright red color in the leaves about the first of July. Fruits are seldom produced on infected branches; but when they occur, they are dwarfed, light colored, and pointed.

The disease is widespread on chokecherries in Idaho. A preliminary survey indicates that redleaf occurs in a continuous line from Latah county in the north through Nez Perce, Idaho, Valley, Adams, Washington, Payette, Gem, Ada, and Canyon counties in the south. Blodgett (6) in 1940 observed this condition generally distributed from Weiser to Sandpoint.

The study of the nature and control of stone-fruit virus diseases has been organized on a broad basis in the United States, and several Canadian provinces are cooperating in the program. An inter-regional committee, four regional committees, and individual state technical committees are working on the range of host plants for each disease. These committees are endeavoring to find how many kinds of fruits each virus infects and to find test plants for distinguishing and isolating the viruses. Other committees are cooperating in collecting disease-free root stocks so that root stocks known to be free from virus infection will be available for nurserymen and growers.

The Inter-regional Host Plant Range committee recently listed 45 virus diseases of stone fruits which have been described in the United States. Some of these are doubtless duplicates; others of minor importance. Some of the best known of these diseases are peach yellows, little peach, peach rosette, phony peach, peach mosaic, red suture, eastern and western X, peach wart, and peach mottle. These are for peaches alone. On cherries the list includes little cherry, buckskin, albino, pink fruit, mottle leaf, rusty mottle, Lambert mottle, rasp leaf, twist leaf, black canker and cherry yellows. Prune dwarf, diamond canker, and standard prune mosaic attack that fruit; and the virus shows up as ring spot on apricots.

A few of these have appeared in Idaho. These diseases have been listed in order to show how complicated the problem is and to indicate the vast amount of work which has been done and is now being done in this field.

Survey in Idaho*

INTRODUCTION

Early in 1948, the North Idaho Horticultural Society and the Idaho State Horticultural Society passed resolutions asking for a survey of Idaho cherry orchards for the western X little cherry disease and of Idaho peach orchards for the western X disease. In attempting to carry out the wishes of these two organizations, a cooperative survey was first conducted in 1948 by the University of Idaho Agricultural Experiment Station and the Idaho State Department of Agriculture. In 1948 and 1949, the Idaho Crop Pest Control and Research Commission supplied funds for part of the work.

Prior to the 1948 survey of the Idaho cherry orchards, the University of Idaho Agricultural Experiment Station Circular number 113 entitled **Little Cherry Disease Threatens Idaho Orchards** was published jointly by the University and the State Department of Agriculture. This circular contains a brief history, a description and color pictures of the western X little cherry disease. Prior to the 1949 surveys, two additional circulars were published. One was a supplement to the little cherry circular published in 1948. This supplement contains a brief report on the findings during the 1948 survey of Idaho cherry orchards and an announcement of the 1949 survey. The second circular published in 1949 was University of Idaho Agriculture Experiment Station Circular No. 115 entitled **Western X Disease of Peaches in Idaho.**

*Survey results for 1948 have been previously reported (18, 19, 20).

PROCEDURE

Inspection crews both years attempted to survey all commercial cherry and peach orchards in the State. When time permitted, crew members inspected additional trees in some areas where there were no commercial orchards.

In each cherry orchard inspected, both sides of each tree were examined by the inspectors working in pairs. In starting to inspect an orchard, one inspector walked down the outside of the orchard looking at each tree in the first row. The second inspector walked between the first and second rows looking at the trees on either side of him. When the end of the row was reached, one inspector walked backed between the second and

third rows while the other returned between the third and fourth rows. In this way each tree was checked twice and both sides of the tree were examined.

Each property inspected was recorded on a "property card." On this was listed the name of the owner, his address, and directions for reaching the property and orchard. The cultural status of the orchard, number of trees on the property and number of orchards on the property were also recorded. When trees were located that showed symptoms of little cherry, an "action card" was made out, listing the number of trees on the property and the number of diseased trees observed. In addition to the action card, all orchards showing infection were mapped showing that portion of the orchard in which the infected trees were located. These maps were attached to the action cards.

After each property was inspected an "Owner's Report" was made out. On these the number of cherry trees inspected, the number of cherry trees infected with little cherry and the name of the inspector were entered. This report was given to the owner of the property. With slight modification, the same procedure was followed in the survey of peach orchards. The cherry survey was conducted from about June 15 to July 20 each year. This was followed by the peach survey which terminated September 1.

RESULTS

Table 1 gives a general summary of the 4 years' survey for the western X little cherry disease in cherry orchards in Idaho. Table 2 brings together the totals of trees inspected and infected, properties inspected and infested and percentage of trees infected for each of the 4 years.

Certain facts should be called to mind in the interpretation of these data. The first that the survey in 1950 was not complete in that there was a short cherry-fruit crop and many trees did not bear fruit. It was therefore impossible to determine if they were diseased. The second reason is that in 1951 the survey was quite limited in Nez Perce and Latah counties as frost reduced the cherry crop materially in these counties. The third reason is that although for the most part the same orchards were surveyed each year when there was a cherry crop, additional orchards were often included which had not been in production the previous year. The total percentage of infection for the state for each of the 4 years are not entirely comparable.

Finally, the fact that some growers removed infected trees each year, others removed a part of them and still others none at all, is an important consideration.

Table 3 presents data for Gem county where the disease has been found each year in some abundance.

In Gem county only one new property was found infested in 1950. In 1951 12 properties were free from disease where infection had occurred previously and only four properties found free before were infeested in 1951. Twenty-five properties were found free from infestation all 4 years.

Table 4 gives a comparison by counties of infection of peaches and cherries by western X disease virus in 1951. There seems to be little relationship between the distribution of the disease on peach and cherry. Although it has been shown experimentally by several workers (16, 24, 14,) that the disease may be transmitted between these hosts by grafting and by certain insects, natural spread in the field from peaches to cherries and from cherry to peach does not appear to be common. The disease on peaches is much more widespread than on cherries. Indeed, it is found generally distributed in the state where peaches are grown. Large areas are free from infection on cherries and the areas of greatest infection are quite localized. In the 1951 survey, 159 cherry properties were inspected in southern Idaho and only 37 of these were infested. These were located in Ada, Gem, Adams, and Payette counties. All other counties in southern Idaho covered by the survey were free from infection.

Table 5 presents data for 4 years' survey for western X on peaches. It will be noted that the percentage of infected trees was less each year but as the total trees surveyed was much greater in later years comparison is perhaps not justified. The survey of peach orchards revealed that 47 properties showed infestation in 1950 when all infected trees were removed in 1949. In 1950 twenty-six properties were found to be free of the disease when infected trees were removed in 1949. Of 274 properties surveyed in 1950, 150 showed no infection; 124 were infected. Of 392 properties surveyed in 1951, 255 were free from infection; 137 were infected.

Table 6 gives a history of nine orchards in Gem county with the highest amount of infection. In most cases infected trees were removed each year. It would appear that infection persists in spite of tree removal in most orchards where a large number of trees are infected.

CONCLUSIONS AND RECOMMENDATIONS

The results of the surveys conducted in Idaho have not changed the recommendations for the control of the disease caused by the western X disease virus. Removal of all infected peach trees will help to reduce the source of infection and prevent spread of the disease to healthy peach trees.

Control of the disease in cherry orchards where it is severe will be difficult. Infection in some orchards in Gem county has been reduced quite materially or eliminated entirely by tree removal even where a comparatively high percentage of trees was infected. In other orchards the removal program has not been so successful in checking spread of the disease. Many orchards where only a few trees were infected, have remained free from evidence of the disease when infected trees were removed in 1948 or 1949. Removal of infected trees is the only known means of control and is strongly advocated.

Careful selection of virus-free propagation wood for both peaches and cherries should do much to prevent introduction of new sources of infection into commercial orchards of Idaho.

A general survey of peach and cherry orchards will not be conducted in 1952. Growers are urged to become thoroughly familiar with the disease on both peaches and cherries and to remove infected trees at once. Delay in removal may give the virus a chance to spread to healthy trees. All assistance possible will be given by the University to acquaint growers with the appearance of diseased trees. Spot surveys in problem orchards and in certain badly infested areas will be made by the University in the summer of 1952 in order to study more carefully the means and rate of spread in these areas and the effect of tree removal upon the control of this threat to the stone fruit industry in Idaho.

TABLE 1A

RESULTS OF IDAHO WESTERN X LITTLE CHERRY SURVEY IN 1948, 1949, 1950 and 1951
TREES INSPECTED AND TREES INFECTED

County	Trees Inspected				Trees Infected			
	'48	'49	'50	'51	'48	'49	'50	'51
Ada	*	373	373	362	*	5	0	2
Adams	1	137	141	137	1	23	27	30
Bonner	144	161			0	0		
Canyon	5942	5938	5938	6190	3	1	0	0
Gem	35320	36101	34058	36059	278	417	72	202
Gooding	400	400			0	0		
Idaho	*	23	26	26	*	5	3	2
Jerome	70	70			0	0		
Kootenai	2094	2289			0	0		
Latah	2587	2599	2588	2473	0	0	0	1
Nez Perce	4543	8535	8667	1421	361	858	601	8
Payette	5075	5447	5289	4843	258	321	20	268
Twin Falls	1994	7225	6773	1397	0	0	0	0
Washington	1003	1233	1232	45	0	27	0	0
TOTAL	59173	70531	65085	52953	901	1657	723	513

Only spot check in Idaho and Nez Perce Counties.
Per cent trees infected in 1948-1.52, in 1949-2.35, in 1950-1.07 and in 1951-.94.
* No inspection in 1948.

TABLE 1B

RESULTS OF IDAHO WESTERN X LITTLE CHERRY SURVEY IN 1948, 1949, 1950 and 1951
PROPERTIES INSPECTED AND PROPERTIES INFESTED

County	Properties Inspected				Properties Infested			
	'48	'49	'50	'51	'48	'49	'50	'51
Ada	*	10	10	11	*	3	0	2
Adams	1	5	5	6	1	3	3	3
Bonner	4	5			0	0		
Canyon	36	41	41	48	2	1	0	0
Gem	64	66	72	67	21	32	16	29
Gooding	1	1			0	0		
Idaho	*	3	3	1	*	3	2	1
Jerome	1	1			0	0		
Kootenai	15	16			0	0		
Latah	6	7	7	6	0	0	0	1
Nez Perce	50	134	192	13	16	87	61	2
Payette	13	19	19	20	3	3	1	3
Twin Falls	9	15	17	9	0	0	0	0
Washington	1	6	6	6	0	2	0	0
TOTAL	201	329	372	187	43	134	83	41

Only spot check in Idaho and Nez Perce counties.
*No inspection in 1948.

TABLE 2

DATA FOR FOUR YEARS OF SURVEY FOR WESTERN X LITTLE CHERRY DISEASE IN IDAHO

	1948	1949	1950	1951
Total Trees	59173	70531	65085	52953
Trees Infected	901	1657	723	513
Properties Inspected	201	329	372	187
Properties Infested	43	134	83	41
Percentage Infected Trees	1.52	2.35	1.07	.94

TABLE 3

DATA FOR FOUR YEARS OF SURVEY FOR WESTERN X LITTLE CHERRY ON CHERRIES IN GEM COUNTY, IDAHO

	1948	1949	1950	1951
Total Properties	64	66	72	67
Number Properties Infested	21	32	16	29
Number Properties No Infection	43	34	51	38

TABLE 4

NUMBER OF CHERRY TREES AND PEACH TREES IN IDAHO INFECTED WITH WESTERN X DISEASE VIRUS AND NUMBER OF PROPERTIES WHERE THESE INFECTIONS OCCURRED IN 1951

County	Trees Infected		Properties Infested		Inspected			
	Cherry	Peach	Cherry	Peach	Cherry		Peach	
					Trees	Prop.	Trees	Prop.
Ada	2	19	2	8	362	11	2235	13
Adams	30		3		137	6		
Canyon	0	412	0	44	6190	43	87258	82
Gem	202	842	29	53	36059	67	32239	63
Gooding		6		1			796	1
Idaho	2	11	1	3	26	1	899	9
Latah	1		1		2473	6		
Nez Perce	8	80	2	23	1421	13	9878	188
Payette	268	28	3	2	4843	20	4525	20
Twin Falls	0	3	0	2	1397	17	12631	10
Washington	0	29	0	1	45	6	1182	6
TOTALS	513	1430	41	137	52953	190	151643	392

TABLE 5

DATA FOR FOUR YEARS OF SURVEY FOR WESTERN X ON PEACHES

	1948	1949	1950	1951
Number of Peach Trees Inspected	29376	121685	128666	151643
Number of Peach Trees Infected	1664	3406	1413	1430
Percentage of Infection	5.66%	2.80%	1.1%	.94%

TABLE 6

HISTORY OF ORCHARDS WITH THE MOST INFECTED CHERRY TREES IN GEM COUNTY, IDAHO

Orchard Number	Infected Trees 1948	1949	1950	1951	Total Trees in 1951
No. 1	12	19	24	41	1200
No. 2	4	7	14	22	345
No. 3	2	1	5	18	395
No. 4	12	3	3	12	230
No. 5	70	70	10	29	2100
No. 6	89	99	0	6	150
No. 7	0	13	0	2	500
No. 8	22	11	3	6	960
No. 9	1	34	0	0	315

SURVEY PERSONNEL

The field crews involved in the surveys for the years were as follows: For the Idaho Agricultural Experiment Station: Carl W. Nichols, Technician, Field Supervisor (1948 and 1949), Dr. Ray Davis, Botanist, Idaho State College, Pocatello, Field Supervisor (1950 and 1951), W. C. Mason (1948), E. L. Phillips (1948), C. A. Hamon (1949 and 1950), J. M. Weinmann (1949, 1950 and 1951), and Charles Weinmann (1951), students of the University of Idaho who acted as field scouts. For the Idaho State Department of Agriculture: A. R. Albee, D. M. Huffman, D. A. Jesson, A. W. Naher, and R. C. Stevens, Inspectors, helped to conduct the field survey and keep the records.

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